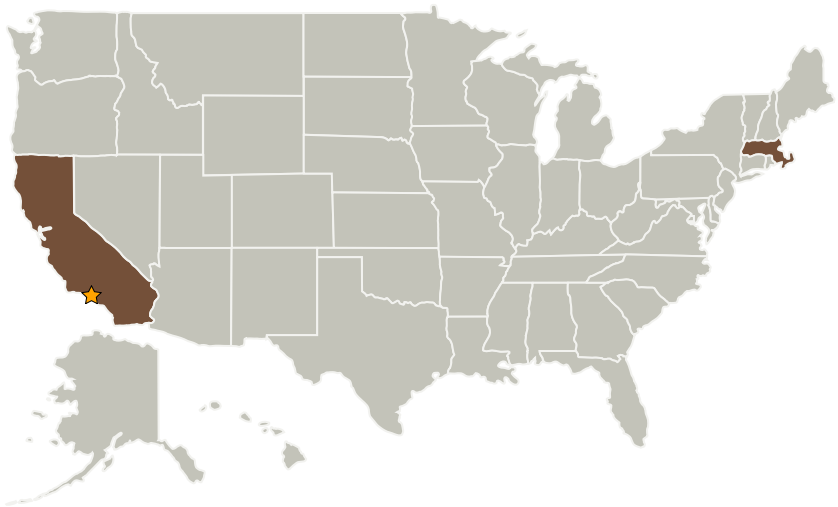
Active MMIC Modulators for High Data Rate Spacecraft Transponders, Phase II

Completed Technology Project (2004 - 2006)

Project Introduction

Space vehicles for deep space exploration rely on microwave and millimeter wave links for communication with earth stations. As the mission of space probes expands, the data rate to be transmitted increases, and effective, compact, methods of modulating the RF carrier with high-speed data become a critical necessity. Passive MMIC modulation approaches introduce loss into the RF path and analog phase shifters in particular can exhibit significant shortcomings such as insertion loss variations and phase-shift range limitations. For more complex digital or hybrid modulation schemes, passive modulator components may also need elaborate calibration look-up tables to achieve desired phase and amplitude modulation accuracy with respect to process and temperature variations. Hittite has recently developed high-performance, active I/Q vector modulator MMICs for communication systems operating up to C-band, based on SiGe and GaAs HBT process technologies. Our Phase I study has shown the feasability of implementing a high-performance X-band modulator on the same 40-50 GHz Ft process. We propose to fabricate and evaluate this modulator as part of this Phase II program. We also propose to use this modulator in conjunction with frequency multipliers recently developed by Hittite to implement a high-speed,linear phase modulator at Ka band.

Primary U.S. Work Locations and Key Partners



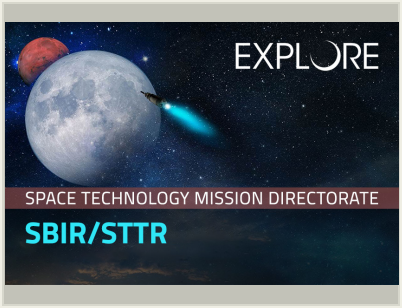


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Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
Hittite Microwave Corporation	Supporting Organization	Industry	Chelmsford, Massachusetts

Primary U.S. Work Locations	
California	Massachusetts

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.1 Optical Communications
    - TX05.1.7 Innovative Signal Modulations